

US011572150B2

(12) **United States Patent**
Andreani

(10) **Patent No.:** **US 11,572,150 B2**
(45) **Date of Patent:** **Feb. 7, 2023**

(54) **DOOR ARRANGEMENT FOR AN AIRCRAFT SEGMENT**

(56) **References Cited**

(71) Applicant: **Airbus Operations GmbH**, Hamburg (DE)

(72) Inventor: **Luc Andreani**, Hamburg (DE)

(73) Assignee: **AIRBUS OPERATIONS GMBH**, Hamburg (DE)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 373 days.

(21) Appl. No.: **16/775,368**

(22) Filed: **Jan. 29, 2020**

(65) **Prior Publication Data**
US 2020/0239120 A1 Jul. 30, 2020

(30) **Foreign Application Priority Data**
Jan. 30, 2019 (DE) 102019102263.0
Jan. 30, 2019 (DE) 102019102267.3

(51) **Int. Cl.**
B64C 1/14 (2006.01)
E05B 77/00 (2014.01)
B64D 25/14 (2006.01)

(52) **U.S. Cl.**
CPC **B64C 1/1423** (2013.01); **E05B 77/00** (2013.01); **B64D 25/14** (2013.01)

(58) **Field of Classification Search**
CPC B64D 25/14; B64C 1/1423; E05B 77/00
See application file for complete search history.

U.S. PATENT DOCUMENTS

3,634,914 A * 1/1972 Schroedter B64D 25/14
24/609
3,852,854 A * 12/1974 Sigurd B64D 25/14
292/259 R
4,715,562 A * 12/1987 Bokalot B64C 1/1407
244/905

(Continued)

FOREIGN PATENT DOCUMENTS

DE 2029167 A 12/1971
DE 102007034471 B4 1/2009

(Continued)

OTHER PUBLICATIONS

German Search Report from German Patent Application No. 102019102263.0; priority document.

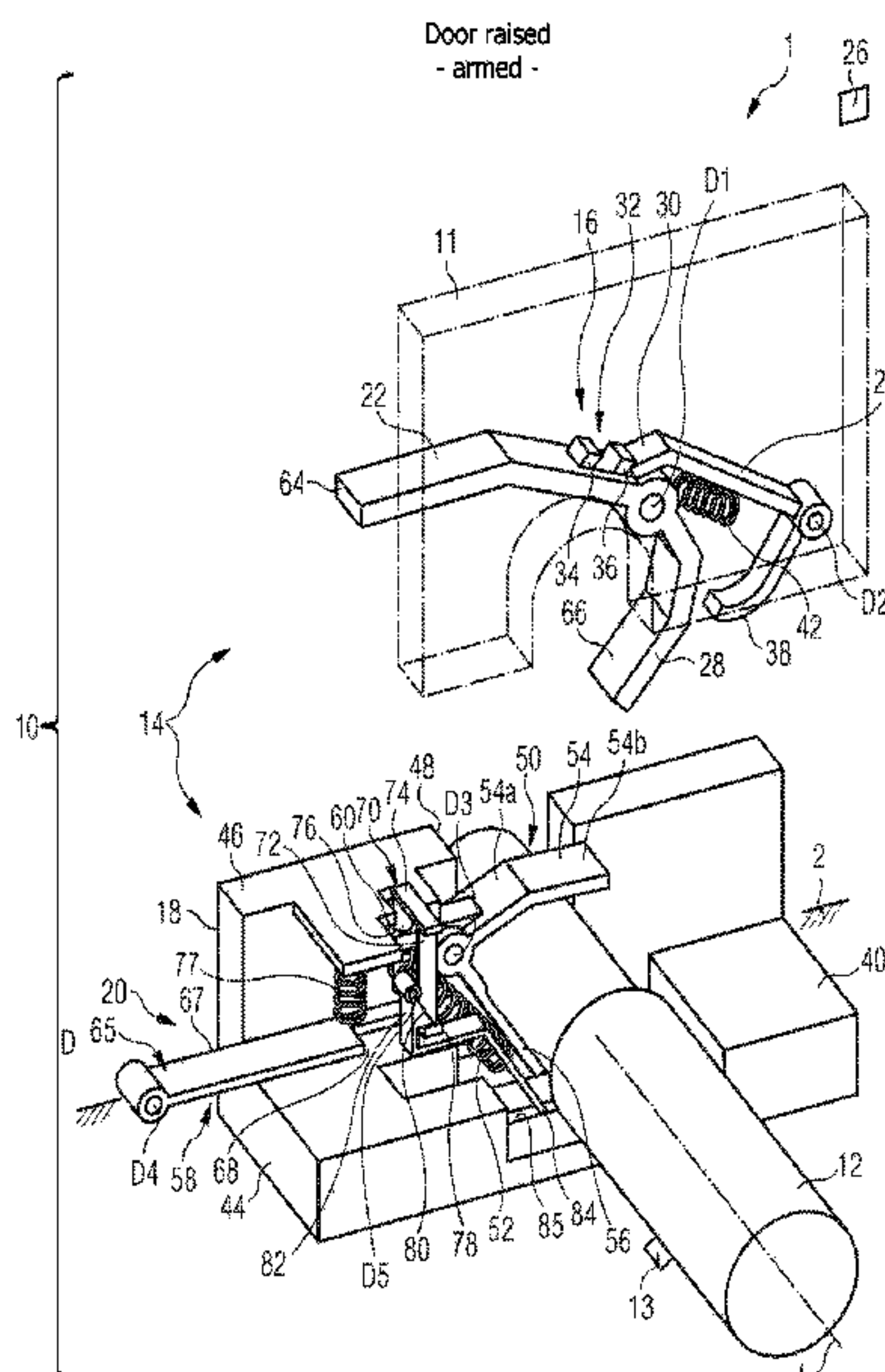
(Continued)

Primary Examiner — Christopher D Hutchens
(74) *Attorney, Agent, or Firm* — Greer, Burns & Crain, Ltd.

(57) **ABSTRACT**

A door arrangement for an aircraft segment, which door arrangement comprises a passenger door, a fuselage portion accommodating the passenger door, and a girt bar for arming and disarming an emergency slide. The passenger door is movable relative to the fuselage portion between a raised position and a lowered position. The girt bar is connectable by means of a connecting arrangement to the passenger door and/or to the fuselage portion. The connecting arrangement comprises a mechanism which is configured to, during arming of the emergency slide, actuate a locking mechanism of an engagement device fastened to the fuselage portion, such that the girt bar is fixed in a decouplable manner to the engagement device.

14 Claims, 5 Drawing Sheets



(56)

References Cited

U.S. PATENT DOCUMENTS

5,400,985 A * 3/1995 Banks B64D 25/14
193/25 B
5,738,303 A * 4/1998 Hamatani B64D 25/14
244/905
8,061,658 B2 11/2011 Büllesbach
10,358,225 B2 7/2019 Minchaue et al.
2009/0020648 A1* 1/2009 Bullesbach B64D 25/14
244/137.2
2020/0239120 A1* 7/2020 Andreani E05B 77/00

FOREIGN PATENT DOCUMENTS

DE 102008032225 A1 1/2010
WO 2013132282 A1 9/2013

OTHER PUBLICATIONS

German Search Report from German Patent Application No.
102019102267.3; priority document.

* cited by examiner

FIG 1

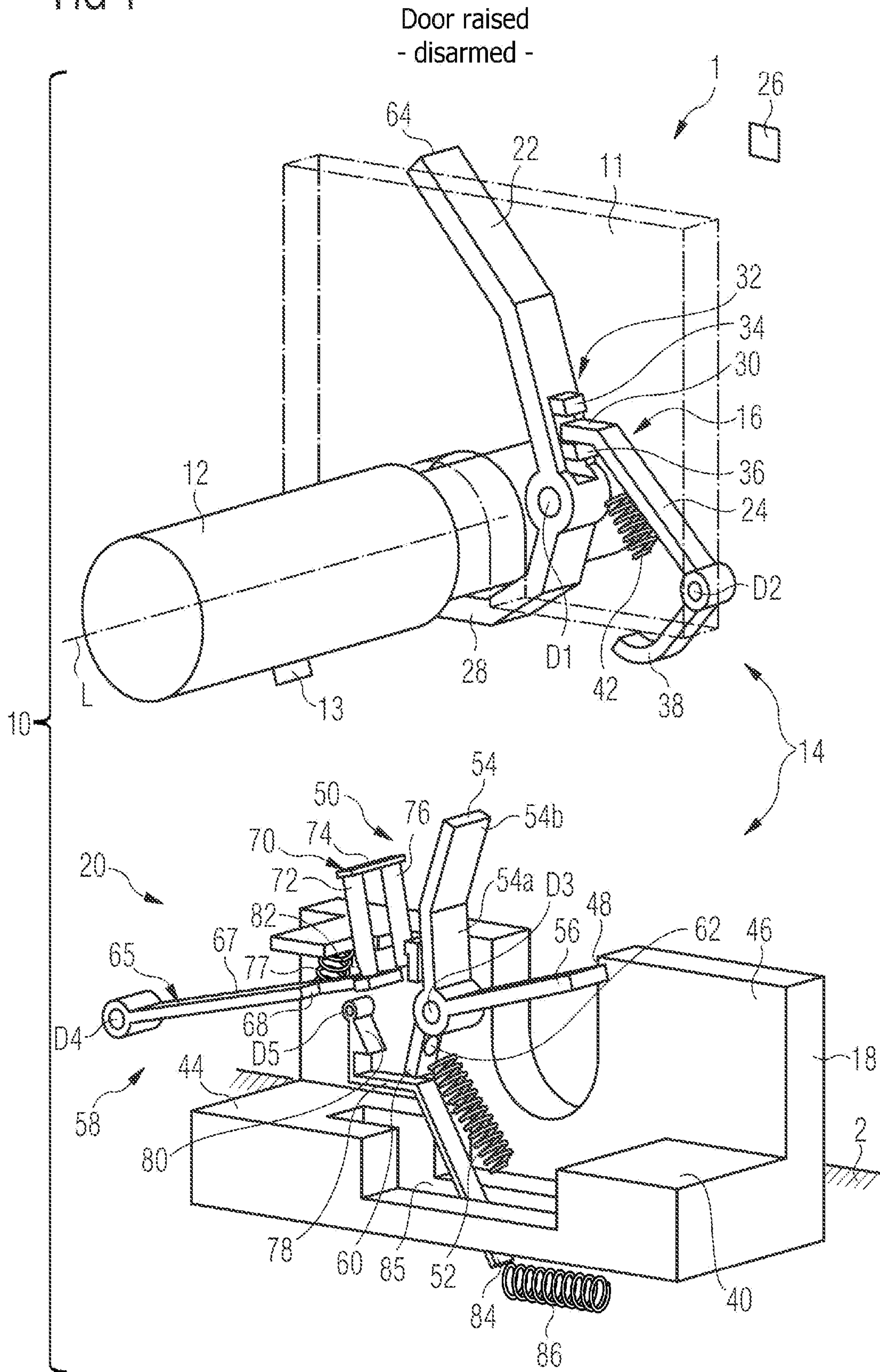


FIG 2

Door lowered
- disarmed -

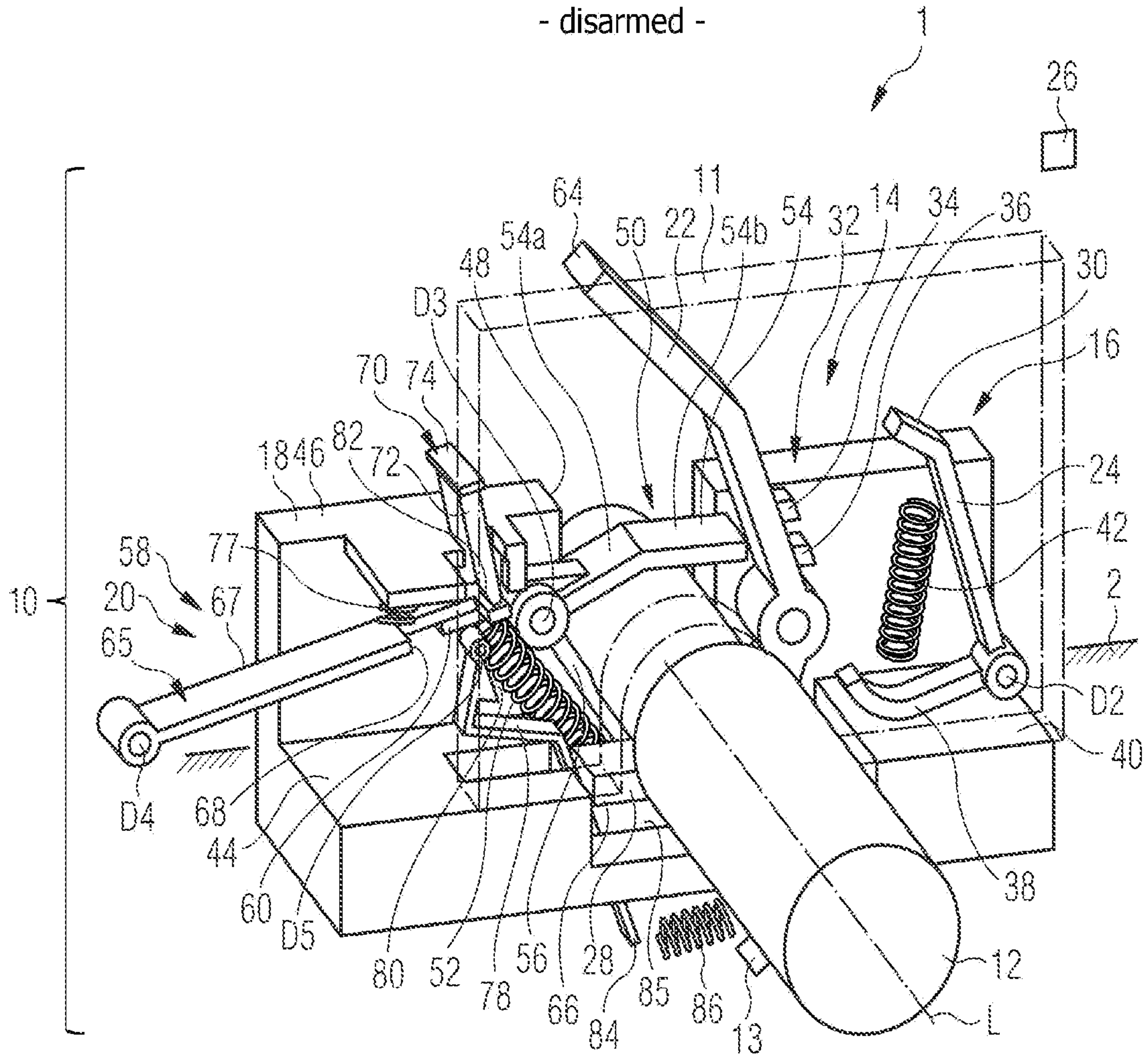


FIG 3a

Door lowered
- armed -

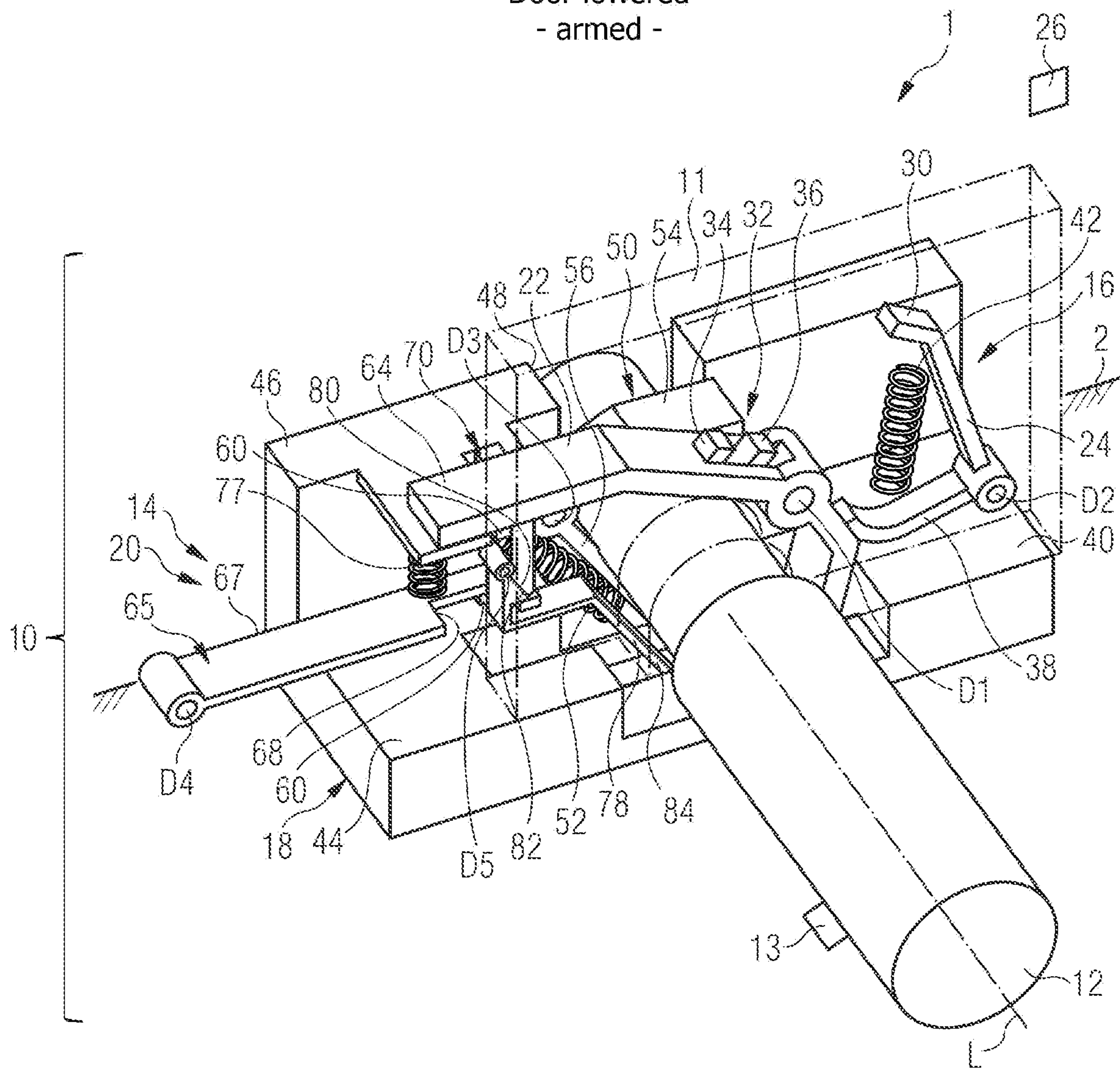


FIG 3b

Door lowered
- armed -

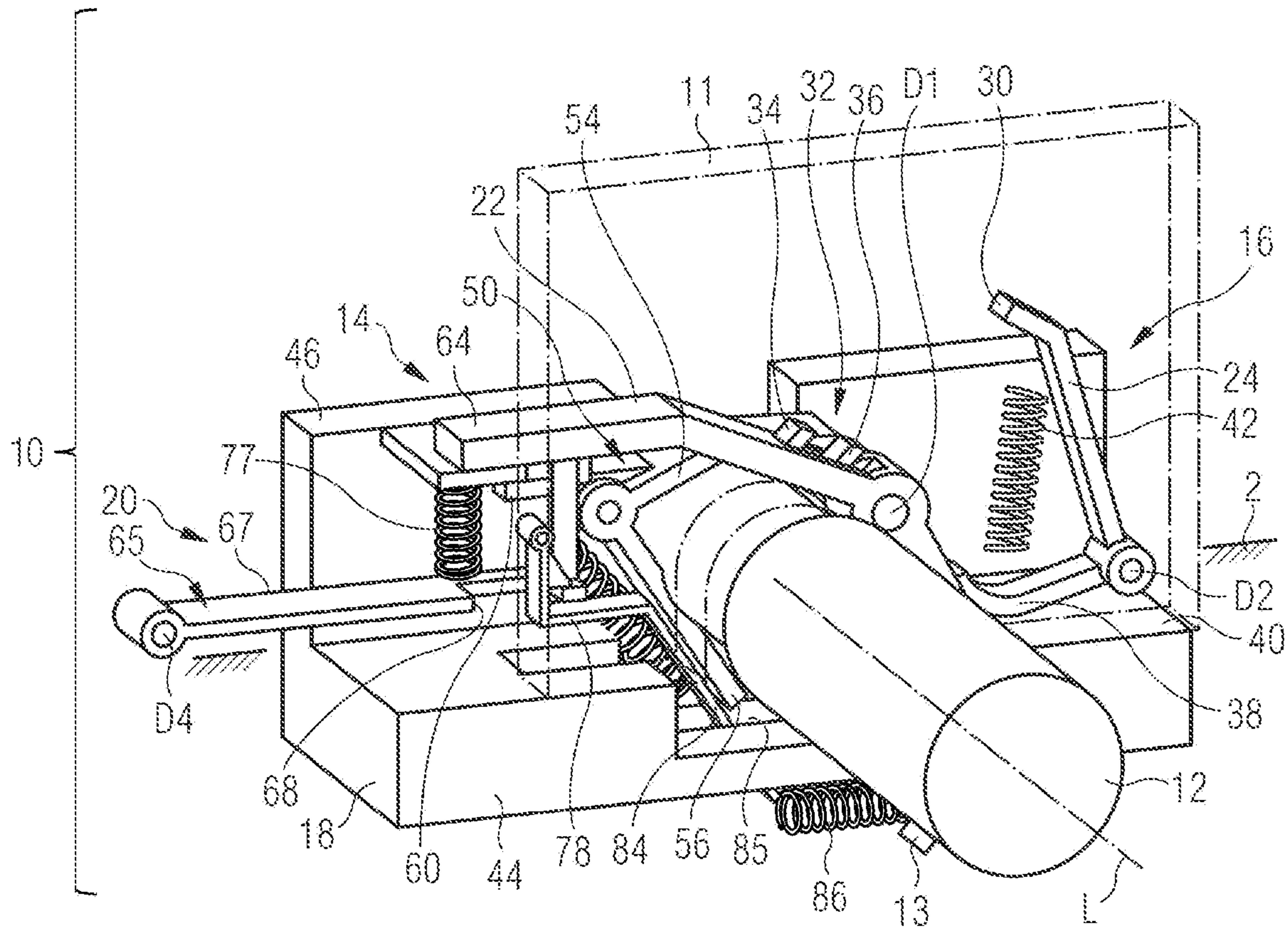
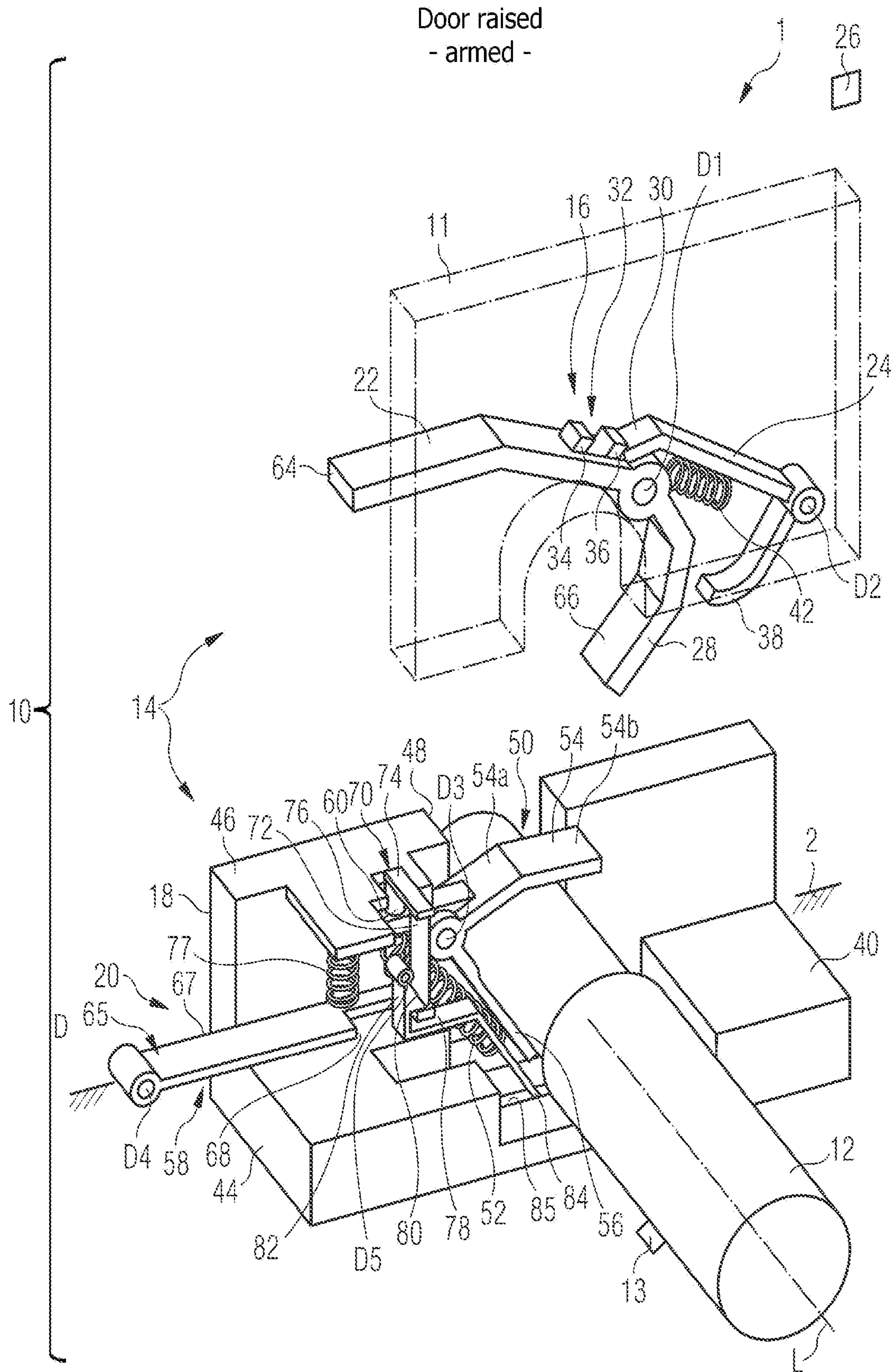


FIG 4



DOOR ARRANGEMENT FOR AN AIRCRAFT SEGMENT

CROSS-REFERENCES TO RELATED APPLICATIONS

This application claims the benefit of the German patent application No. 102019102267.3 filed on Jan. 30, 2019, and the German patent application No. 102019102263.0 filed on Jan. 30, 2019, the entire disclosures of which are incorporated herein by way of reference.

BACKGROUND OF THE INVENTION

The present invention relates to a door arrangement for an aircraft segment. The invention furthermore relates to an aircraft segment equipped with a door arrangement of this type.

BACKGROUND OF THE INVENTION

A door arrangement used in a modern transport aircraft is commonly equipped with an emergency slide kinematic system which comprises a girt bar, an emergency slide connected to the girt bar, and a selector lever provided in the region of an inner side of the passenger door. When the passenger door is open and when the passenger door is closed in the disarmed state of the emergency slide, the girt bar is fastened to the passenger door. The arming of the emergency slide is performed by means of a manual actuation of the selector lever mechanism in the closed state of the passenger door. The arming of the emergency slide induces a movement of the girt bar, as a result of which the girt bar enters into engagement with an engagement device provided in the region of a fuselage portion, which accommodates the passenger door and which is designed, for example, in the form of a door frame portion, of the transport aircraft. If the passenger door is then opened in an emergency situation, the girt bar decouples from the passenger door as a result of the lifting movement of the passenger door. At the same time, the girt bar is locked in its position in the engagement device. As a result, the emergency slide is attached, so as to be ready for use, to the aircraft structure.

SUMMARY OF THE INVENTION

The present invention is directed to an object of specifying a door arrangement for an aircraft segment, and an aircraft segment, which are equipped with an emergency slide kinematic system which is of simple design and is reliable.

A door arrangement for an aircraft segment comprises a passenger door and a fuselage portion accommodating the passenger door. The passenger door is movable relative to the fuselage portion, which accommodates the passenger door, between a raised position and a lowered position. The fuselage portion may be designed, for example, in the form of a door frame and have a door opening that accommodates the passenger door. Furthermore, the door arrangement comprises a girt bar for arming and disarming an emergency slide. The girt bar is connectable by means of a connecting arrangement to the passenger door and/or to the fuselage portion. Accordingly, an emergency slide connected to the girt bar can be selectively connected to the passenger door and/or to the fuselage portion by means of the connecting arrangement.

The connecting arrangement comprises a mechanism which is configured to, during arming of the emergency slide, actuate a locking mechanism of an engagement device fastened to the fuselage portion, in such a way that the girt bar is fixed in a decouplable manner to the engagement device. By means of the interaction of the mechanism of the connecting arrangement with the locking mechanism of the engagement device, the girt bar is thus fixed to the engagement device immediately during the arming of the emergency slide.

Thus, in the case of the door arrangement described here, the emergency slide is securely connected to the fuselage portion already in the armed state, and an additional locking step that first takes place during the activation of the emergency slide is avoided. Furthermore, the mechanism for actuating the locking mechanism of the engagement device is integrated into the connecting arrangement. The door arrangement is accordingly distinguished by an emergency slide kinematic system which is of simple design and small construction and which is reliable.

The mechanism of the connecting arrangement is preferably configured to connect the girt bar to the passenger door in the disarmed state of the emergency slide. In this way, an inadvertent triggering of the emergency slide during the opening of the passenger door is reliably prevented. In addition or alternatively, the engagement device of the connecting device may be configured to connect the girt bar to the fuselage portion in the armed state of the emergency slide. It is thereby ensured that, in an emergency situation, the emergency slide is securely connected to the fuselage portion and is operational without limitation.

The mechanism of the connecting arrangement is preferably furthermore configured to, during disarming of the emergency slide, that is to say, during a transfer of the emergency slide from its armed state into its disarmed state, actuate the locking mechanism of the engagement device fastened to the fuselage portion, in such a way that the locking mechanism is unlocked. By means of the unlocking of the locking mechanism, the decoupling of the girt bar from the engagement device is possible, such that the girt bar can be decoupled from the fuselage portion and connected to the passenger door again. It is thus also the case for the unlocking of the locking mechanism that no separate unlocking step and no separate mechanism are required—rather, the unlocking of the locking mechanism takes place automatically during the course of the disarming of the emergency slide.

The connecting arrangement is preferably furthermore configured to, during the aiming of the emergency slide, hold the girt bar positionally fixed relative to the passenger door situated in its lowered position. In other words, in the case of the passenger door arrangement, it is preferably the case that the position of the girt bar relative to the passenger door is not changed during the transition from disarming to aiming of the emergency slide in the lowered state of the passenger door. In this way, a complex interface between passenger door, girt bar and fuselage portion, which can lead to difficult or complex handling and also interruptions during production and maintenance, is avoided. In particular, it is possible to dispense with a complex kinematic system owing to the transfer of the girt bar between the passenger door and the fuselage portion. The emergency slide securing system of the door arrangement can then be designed to be particularly lightweight, simple and robust with regard to handling and tolerances.

The mechanism preferably comprises a holding element. The holding element may be fastened to the passenger door.

The holding element is, in particular, rotatable about a first rotary axle relative to the passenger door between a holding position and a release position. For example, the holding element may be configured to be transferred from its holding position into its release position by means of an anticlockwise rotation about the first rotary axle. In its holding position, the holding element is preferably configured to connect the girt bar to the passenger door. Accordingly, in the disarmed state of the emergency slide, the holding element is preferably situated in its holding position and in engagement with the girt bar. In this way, the girt bar is securely fixed to the passenger door in the disarmed state of the emergency slide. By contrast, in its release position, the holding element is preferably configured to release the girt bar. Accordingly, during the arming of the emergency slide, the holding element is preferably rotated about the first rotary axle from its holding position into its release position. In this way, the girt bar is released and decoupled from the passenger door.

The holding element may, for example, be designed in the form of a lever with lever arms extending from the first rotary axle. In the region of a first end, the holding element preferably comprises a receiving portion which is configured to receive the girt bar, and hold the latter in its position relative to the passenger door, when the holding element is situated in its holding position in the disarmed state of the emergency slide. The receiving portion may be designed, for example, in the form of a curved lever arm and positioned so as to engage under the girt bar when the holding element is situated in its holding position.

Furthermore, the holding element may be equipped, in the region of a second end, with a first actuation portion which is configured to actuate the locking mechanism of the engagement device such that the girt bar is fixed in a decouplable manner to the engagement device when the holding element is rotated about the first rotary axle relative to the passenger door from its holding position into its release position during the arming of the emergency slide. The first actuation portion may, for example, be configured to come into contact with the locking mechanism of the engagement device and subject the locking mechanism to a pressure force, which locks the locking mechanism, when the holding element is transferred from its holding position into its release position by means of an anticlockwise rotation about the first rotary axle.

The receiving portion of the holding element may comprise a second actuation portion which is configured to actuate the locking mechanism of the engagement device, such that the locking mechanism is unlocked when the holding element is rotated about the first rotary axle relative to the passenger door from its release position into its holding position during the disarming of the emergency slide. The second actuation portion may be arranged directly in the region of the first end of the holding element. In particular, the second actuation portion may be configured to come into contact with the locking mechanism of the engagement device and subject the locking mechanism to a pressure force, which unlocks the locking mechanism, when the holding element is transferred from its release position into its holding position by means of a clockwise rotation about the first rotary axle.

The mechanism preferably also comprises an arresting element. The arresting element may be fastened to the passenger door, adjacently with respect to the holding element. The arresting element is, in particular, rotatable about a second rotary axle relative to the passenger door between a decoupled position and an arresting position. The second

rotary axle of the arresting element extends preferably substantially parallel to the first rotary axle of the holding element. For example, the arresting element may be configured to be transferred from its decoupled position into its arresting position by means of an anticlockwise rotation about the second rotary axle. In its arresting position, the arresting element is preferably configured to arrest the holding element in its holding position and/or its release position.

An arresting position that the arresting element assumes in order to arrest the holding element in its holding position may differ from an arresting position that the arresting element assumes in order to arrest the holding element in its release position. For example, in an arresting position in which it arrests the holding element in its release position, the arresting element may, relative to its decoupled position, be rotated a few degrees further anticlockwise about the second rotary axle than in an arresting position in which it arrests the holding element in its holding position.

In its decoupled position, the arresting element is preferably configured to permit a rotation of the holding element about the first rotary axle. When the arresting element is situated in its decoupled position, it is preferably not in contact with the holding element. Accordingly, the holding element can then be transferred from its holding position into its release position or from its release position into its holding position.

If the passenger door is situated in its raised position and the emergency slide is disarmed, the holding element is preferably, as described above, arranged in its holding position and arrested by means of the arresting element situated in its arresting position. During the lowering of the passenger door, the arresting element is preferably transferred from its arresting position into its decoupled position. As a result, a movement of the holding element from its holding position into its release position, and consequently a decoupling of the girt bar from the passenger door, are made possible. If the passenger door is raised in the armed state of the emergency slide, that is to say, in a state in which the girt bar is fixed to the fuselage portion and is locked in a decouplable manner to the engagement device, the arresting element is preferably moved from its decoupled position into its arresting position again. The arresting element then passes into engagement with the holding element again, and fixes the holding element in its release position. It is thereby ensured that the raising of the passenger door is not impeded by an interaction of the holding element with the girt bar.

The arresting element may, for example, similarly to the holding element, be designed in the form of a lever with lever arms extending from the second rotary axle. In the region of a first end, the arresting element preferably comprises a first arresting device which is configured to engage with a complementary second arresting device of the holding element in order to arrest the holding element in its holding position and/or its release position when the arresting element is situated in its arresting position. The second arresting device of the holding element may comprise a first and a second arresting projection which may extend from a surface, facing toward the arresting element, of the holding element. The first arresting device of the arresting element may then be in engagement selectively with the first or the second arresting projection of the second arresting device of the holding element in order to arrest the holding element selectively in its holding position or its release position.

The first arresting projection is preferably arranged further remote from the first rotary axle, and closer to the second end of the holding element, than the second arresting

5

projection. Accordingly, the holding element is preferably rotated further anticlockwise about the first rotary axle when the first arresting device of the arresting element is in engagement with the second arresting projection than when the first arresting device of the arresting element is in engagement with the first arresting projection. Consequently, the holding element is preferably arrested in its holding position when the first arresting device of the arresting element engages under the first arresting projection. By contrast, the holding element is preferably arrested in its release position when the first arresting device of the arresting element engages under the second arresting projection.

Furthermore, the arresting element may be equipped, in the region of a second end, with a decoupling device which is configured to, during the lowering of the passenger door, abut against an abutment surface, which is formed on the engagement device, in order to rotate the arresting element about the second rotary axle from its arresting position into its decoupled position. In a preferred embodiment of the passenger door arrangement, the arresting element is preloaded into its arresting position, for example by means of a spring. By means of the interaction of the decoupling device with the abutment surface of the engagement device, the arresting element can then be rotated clockwise, counter to the spring-imparted preload force acting on the arresting element, about the second rotary axle in order to transfer the arresting element from its arresting position into its decoupled position.

The passenger door arrangement preferably furthermore comprises an activation device which is configured to activate the arming and disarming of the emergency slide. In particular, the activation device may be configured to trigger a movement of the holding element between its holding position and its release position. The activation device may, for example, comprise a manually actuatable selector lever which is provided in the region of an inner side of the passenger door and which is connected to the mechanism of the connecting arrangement and, in particular, to the holding element of the mechanism. For this purpose, the activation device may for example comprise a Bowden cable, the first end of which is connected to the selector lever and the second end of which is connected to the mechanism, in particular to the holding element.

An actuation of the selector lever is then converted into a corresponding movement of the holding element between its holding position and its release position. In particular, the holding element can be moved from its holding position into its release position by means of a corresponding actuation of the selector lever during the arming of the emergency slide. By contrast, during the disarming of the emergency slide, the holding element is preferably transferred from its release position into its holding position by means of a corresponding actuation of the selector lever.

The engagement device fastened to the fuselage portion may comprise a holding portion. The holding portion extends preferably substantially parallel to the passenger door and substantially perpendicular to the girt bar. Furthermore, the holding portion extends preferably substantially perpendicular to the abutment surface which is formed on the engagement device and against which the decoupling device of the arresting element abuts during the lowering of the passenger door. In the holding portion, there may be formed a receiving recess which is configured to receive the girt bar. Accordingly, the shape and the size of the receiving recess are preferably adapted to the shape and the size of the girt bar.

6

The locking mechanism of the engagement device preferably comprises a lock apparatus which is rotatable about a third rotary axle between an unlocking position and a locking position. When it is situated in its unlocking position, the lock apparatus is preferably configured to permit a decoupling of the girt bar from the engagement device. By contrast, in its locking position, the lock apparatus is configured to fix the girt bar to the engagement device.

Furthermore, the locking mechanism of the engagement device may comprise a blocking mechanism which is configured to, during the arming of the emergency slide, be actuated by the mechanism in order to block the lock apparatus in its locking position. The blocking mechanism is preferably designed so as to be actuatable by the first actuation portion of the holding element when the holding element is, during the arming of the emergency slide, rotated about the first rotary axle relative to the passenger door from its holding position into its release position. Accordingly, the blocking mechanism is preferably configured to be actuated by a pressure force which is exerted on the blocking mechanism by the first actuation portion of the holding element when the holding element, during the arming of the emergency slide, is transferred from its holding position into its release position by means of an anticlockwise rotation about the first rotary axle.

Furthermore, the blocking mechanism is preferably configured to, during the disarming of the emergency slide, be actuated by the mechanism of the connecting arrangement in order to eliminate the blocking of the lock apparatus in its locking position. The blocking mechanism is, in particular, designed so as to be actuatable by the second actuation portion of the holding element when the holding element is, during the disarming of the emergency slide, rotated about the first rotary axle relative to the passenger door from its release position into its holding position. Accordingly, the blocking mechanism is preferably configured to be actuated by a pressure force which is exerted on the blocking mechanism by the second actuation portion of the holding element when the holding element, during the disarming of the emergency slide, is transferred from its release position into its holding position by means of a clockwise rotation about the first rotary axle.

The lock apparatus is, in particular, configured to, during the lowering of the passenger door in the disarmed state of the emergency slide, interact with the girt bar such that the lock apparatus is rotated from its unlocking position into its locking position. In particular, the lock apparatus is configured to come into contact with the girt bar during the lowering of the passenger door in the disarmed state of the emergency slide. As soon as the girt bar bears against the lock apparatus, the girt bar preferably exerts a pressure force on the lock apparatus, as a result of which the lock apparatus is rotated clockwise about the third rotary axle from its unlocking position into its locking position.

The lock apparatus may furthermore be configured to, during the raising of the passenger door in the disarmed state of the emergency slide, too, interact with the girt bar such that the lock apparatus is rotated from its locking position into its unlocking position. For example, the lock apparatus may be designed such that, during the raising of the passenger door in the disarmed state of the emergency slide, the girt bar comes into contact with the lock apparatus and exerts a pressure force on the lock apparatus, as a result of which the lock apparatus is rotated anticlockwise about the third rotary axle from its locking position into its unlocking position.

In addition or alternatively, the lock apparatus may, however, also be preloaded by spring means into its unlocking position. The lock apparatus may then be configured to be rotated about the third rotary axle from its unlocking position into its locking position by a force which is exerted on the lock apparatus by the girt bar during the lowering of the passenger door and which opposes the spring-imparted preload force. During the raising of the passenger door, the spring-imparted preload force may then effect or assist the return movement of the lock apparatus from its locking position into its unlocking position.

In a preferred embodiment, the lock apparatus comprises a first lock arm which extends from the third rotary axle. The first lock arm is preferably configured to engage over the girt bar when the passenger door is situated in its lowered state. The first lock arm then serves for fixing the girt bar to the engagement device. In particular, the first lock arm may engage over the girt bar in the lowered state of the passenger door such that the girt bar is fixed in the receiving recess of the holding portion.

Furthermore, the lock apparatus may comprise a second lock arm which extends from the third rotary axle. The second lock arm is preferably configured to engage under the girt bar when the passenger door is situated in its lowered state. In the case of such an embodiment of the lock apparatus, the girt bar comes into contact with the second lock arm, and exerts a pressure force on the second lock arm, during the lowering of the passenger door. As a result, the lock apparatus is rotated clockwise about the third rotary axle from its unlocking position into its locking position, in which the second lock arm finally engages under the girt bar, while the first lock arm engages over the girt bar.

Thus, in the lowered state of the passenger door, the first and the second lock arm of the lock apparatus situated in its locking position form a type of "gripper" which encloses the girt bar. An angle defined by the first and the second lock arm of the lock apparatus is, in particular, adapted to an outer diameter and an outer contour of the girt bar. Furthermore, the angle must be selected such that, during the lowering of the passenger door, the girt bar can be moved past the first lock arm of the lock apparatus, which at this point in time is situated in its unlocking position, and abut against the second lock arm. For example, the first and the second lock arm of the lock apparatus may define an angle of approximately 70 to 90°.

In order to permit particularly secure fixing of the girt bar to the engagement device, the first lock arm may comprise a first portion, which is arranged adjacent to the third rotary axle, and a second portion, which defines a free end of the first lock arm and which is inclined relative to the first portion in the direction of the second lock arm. The angle defined by the first and the second portion of the first lock arm may for example lie in a range of approximately 135 to 170°.

The blocking mechanism may comprise a first lock element which is formed on the lock apparatus and which extends from the third rotary axle. The first lock element preferably extends from the third rotary axle in such a way that the first lock element forms an angle $>90^\circ$ both with the first lock arm and with the second lock arm of the lock apparatus. For example, the first lock element may be designed in the form of a plate or of a block with an opening formed therein.

Furthermore, the blocking mechanism preferably comprises a second lock element of complementary form with respect to the first lock element. The second lock element is preferably rotatable about a fourth rotary axle between a

non-engagement position and an engagement position. When situated in its non-engagement position, the second lock element preferably releases the first lock element in order to eliminate the blocking of the lock apparatus in its locking position. By contrast, when arranged in its engagement position, the second lock element is preferably in engagement with the first lock element in order to block the lock apparatus in its locking position.

The second lock element preferably comprises a lever arm which extends from the fourth rotary axle. Furthermore, the second lock element may comprise a pin which is attached to the lever arm such that, when the second lock element is transferred from its non-engagement position into its engagement position, said pin is received in the opening formed on the first lock element. By means of the interaction of the pin of the second lock element with the opening of the first lock element, the lock apparatus can then be reliably blocked in its locking position.

Furthermore, the blocking mechanism may comprise a third lock element which is rotatable about a fifth rotary axle between a non-engagement position and an engagement position. When situated in its non-engagement position, the third lock element preferably releases the second lock element in order to permit a rotation of the second lock element from its engagement position into its non-engagement position. By contrast, when arranged in its engagement position, the third lock element is preferably in engagement with the second lock element in order to fix the second lock element in its engagement position.

A detent opening may be formed on the second lock element. For example, the detent opening may be formed in the lever arm of the lock element. By contrast, the third lock element may be equipped with a detent lug. When both the second lock element and the third lock element are situated in their engagement position, the detent lug of the third lock element can project through the detent opening of the second lock element and bear against a detent surface which is formed adjacent to the detent opening on the lever arm of the lock element.

The second lock element may comprise a first actuation element which is configured to, during the arming of the emergency slide, be actuated by the mechanism in order to move the second lock element from its non-engagement position into its engagement position. In particular, the first actuation element may be configured to be actuated by a force, in particular a pressure force, which is exerted on the first actuation element by the first actuation portion of the holding element when the holding element, during the arming of the emergency slide, is transferred from its holding position into its release position by means of an anticlockwise rotation about the first rotary axle. By means of the force exerted on the first actuation element by the first actuation portion of the holding element, the second lock element is then preferably rotated clockwise about the fourth rotary axle from its non-engagement position into its engagement position.

The first actuation element of the second lock element may extend, for example in the region of a free end of the second lock element, upwards from a top side of the lever arm of the second lock element. In particular, the first actuation element may comprise a carrier portion which extends substantially perpendicularly upwards from the top side of the lever arm and which bears a contact portion which extends substantially perpendicular to the carrier portion and substantially parallel to the lever arm. The first actuation portion of the holding element may then come into contact with the contact portion and cause the second lock

element to perform a clockwise rotation about the fourth rotary axle when the holding element, during the arming of the emergency slide, is rotated anticlockwise about the first rotary axle from its holding position into its release position. The pin of the second lock element may extend substantially perpendicular to the contact portion from a bottom side, facing toward the lever arm, of the contact portion.

In addition or alternatively, the third lock element may comprise a second actuation element which is configured to, during the disarming of the emergency slide, be actuated by the mechanism in order to move the third lock element from its engagement position into its non-engagement position. In particular, the second actuation element may be configured to be actuated by a force, in particular a pressure force, which is exerted on the second actuation element by the second actuation portion of the holding element when the holding element, during the disarming of the emergency slide, is transferred from its release position into its holding position by means of a clockwise rotation about the first rotary axle. By means of the force exerted on the second actuation element by the second actuation portion of the holding element, the third lock element is then preferably rotated clockwise about the fifth rotary axle from its engagement position into its non-engagement position.

In a preferred embodiment, the second lock element is preloaded into its non-engagement position by spring means. By contrast, the third lock element is preferably preloaded into its engagement position by spring means. Then, during the arming of the emergency slide, the second lock element is moved into its engagement position, counter to the spring-imparted preload of the second lock element, by means of the force exerted on the second lock element by the mechanism, that is to say, by the first actuation portion of the holding element, until the second lock element enters into engagement with the third lock element, which is situated in its engagement position, and is locked in its engagement position by the third lock element. By contrast, during the disarming of the emergency slide, the third lock element is moved into its non-engagement position, counter to the spring-imparted preload of the third lock element, by means of the force exerted on the third lock element by the mechanism, that is to say, by the second actuation portion of the holding element. As a result, the third lock element disengages from the second lock element, such that the second lock element is moved back into its non-engagement position again owing to its spring-imparted preload.

An aircraft segment comprises a door arrangement described above.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of the door arrangement according to the invention is illustrated in the appended schematic drawings. In the drawings:

FIG. 1 shows a diagrammatic sketch of an aircraft segment which comprises a door arrangement equipped with an emergency slide kinematic system, wherein a passenger door of the door arrangement is situated in a raised position and an emergency slide is disarmed;

FIG. 2 shows a diagrammatic sketch of the aircraft segment as per FIG. 1, wherein the passenger door of the door arrangement is situated in a lowered position and the emergency slide is disarmed;

FIGS. 3a and 3b show diagrammatic sketches of the aircraft segment as per FIG. 1, wherein the passenger door of the door arrangement is situated in a lowered position and the emergency slide is armed; and

FIG. 4 shows a diagrammatic sketch of the aircraft segment as per FIG. 1, wherein the passenger door of the door arrangement is situated in a raised position and the emergency slide is armed.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the description that follows, for the purposes of explanation but not limitation, specific details will be described in order to impart a basic understanding of the technology proposed here. It is self-evident to a person of average skill in the art that the present technology may be realized in other exemplary embodiments which depart from these specific details.

FIGS. 1 to 4 each show an aircraft segment 1 equipped with a door arrangement 10, wherein the external shapes of the door arrangement 10 and of the aircraft segment 1 are merely schematically indicated. The door arrangement 10 comprises a passenger door 11, which is illustrated only in certain portions, and a fuselage portion 2 accommodating the passenger door 11. The passenger door 11 is movable relative to the fuselage portion 2, which may for example be designed in the form of a door frame equipped with a door opening, and which is likewise merely schematically indicated in the figures, between a raised position and a lowered position.

Furthermore, the door arrangement 10 comprises a girt bar 12 for arming and disarming an emergency slide 13. For this purpose, the girt bar 12 is connected, as main interface part, to the emergency slide 13, which is likewise merely schematically indicated in the figures. The girt bar 12 is connectable by means of a connecting arrangement 14 to the passenger door 11 and/or to the fuselage portion 2. The connecting arrangement 14 comprises both passenger-door-side components, that is to say components assigned to the passenger door 11, and fuselage-portion-side components, that is to say, components assigned to the fuselage portion 2. The passenger-door-side components of the connecting arrangement 14 can be seen particularly clearly in an upper region of FIGS. 1 and 4. By contrast, the fuselage-portion-side components of the connecting arrangement 14 can be seen particularly clearly in a lower region of FIGS. 1 and 4.

The connecting arrangement 14 of the door arrangement 10 comprises a mechanism 16 which is assigned to the passenger-door-side components of the connecting arrangement 14 and which is configured to connect the girt bar 12 to the passenger door 11 in a disarmed state of the emergency slide 13 as illustrated in FIGS. 1 and 2. In the case of the emergency slide kinematic system illustrated in the figures, the mechanism 16 is fastened exclusively to the passenger door 11 and not to the fuselage portion 2, to a cabin floor or to some other element of the aircraft segment 1.

Furthermore, the connecting arrangement 14 comprises an engagement device 18 which is assigned to the fuselage-portion-side components of the connecting arrangement 14 and which is configured to connect the girt bar 12 to the fuselage portion 2 in an armed state of the emergency slide 13 as illustrated in FIGS. 3a, 3b and 4. In the case of the emergency slide kinematic system illustrated in the figures, the engagement device 18 is fastened exclusively to the fuselage portion 2 and not to the passenger door 11. The engagement device 18 comprises a locking mechanism 20, which is configured to fix the girt bar 12 to the engagement device 18 in a decouplable manner in the armed state of the emergency slide 13.

11

The locking mechanism 20 is actuated by the mechanism 16. In particular, the mechanism 16 is configured to actuate the locking mechanism 20 during the arming of the emergency slide 13 such that the locking mechanism 20 is activated and locked and the girt bar 12 is consequently fixed in a decouplable manner to the engagement device. It is thereby ensured that the girt bar 12 is fixed to the engagement device 18 and consequently to the fuselage portion 2 already during the aiming of the emergency slide 13.

Furthermore, the mechanism 16 is configured to, during a disarming of the emergency slide 13, that is to say, during a transfer of the emergency slide 13 from its armed state into its disarmed state, actuate the locking mechanism 20 such that the locking mechanism 20 is unlocked. By means of the unlocking of the locking mechanism 20, the decoupling of the girt bar 12 from the engagement device 18 is possible, such that the girt bar 12 can be decoupled from the fuselage portion 2 and connected to the passenger door 11 again.

The connecting arrangement 14 is furthermore configured to, during the arming of the emergency slide 13, hold the girt bar 12 positionally fixed relative to the passenger door 11 situated in its lowered position. Accordingly, in the case of the door arrangement 10, it is the case that the position of the girt bar 12 relative to the passenger door 11 is not changed during the transition from disarming to arming of the emergency slide 13 in the lowered state of the passenger door 11.

The mechanism 16 assigned to the passenger-door-side components of the connecting arrangement 14 comprises a holding element 22 and an arresting element 24. The holding element 22 is fastened to the passenger door 11 so as to be rotatable about a first rotary axle D1 relative to the passenger door 11. By means of a rotation about the rotary axle D1, the holding element 22 can be moved between a holding position, shown in FIGS. 1 and 2, and a release position, illustrated in FIGS. 3a, 3b and 4. In particular, as is clear from a comparison of FIGS. 1 and 2 with FIGS. 3a, 3b and 4, the holding element 22 is transferred from its holding position into its release position by means of an anticlockwise rotation about the first rotary axle D1 during the arming of the emergency slide 13. Conversely, the holding element 22 is returned from its release position into its holding position by means of a clockwise rotation about the first rotary axle D1 during the disarming of the emergency slide 13.

The arming and disarming of the emergency slide 13 is activated by means of an activation device 26, which is merely schematically indicated in the figures. The activation device 26 comprises a manually actuatable selector lever, which is provided in the region of an inner side of the passenger door 11 but which is not illustrated in the figures, and a Bowden cable, which is likewise not shown in the figures. A first end of the Bowden cable is connected to the selector lever, whereas a second end of the Bowden cable is connected to the holding element 22. In this way, an actuation of the selector lever can be converted into a corresponding movement of the holding element 22.

In particular, during the arming of the emergency slide 13, the holding element 22 is moved from its holding position, shown in FIGS. 1 and 2, into its release position, illustrated in FIGS. 3a, 3b and 4, by means of a corresponding actuation of the selector lever which induces an anticlockwise rotation of the holding element 22 about the first rotary axle D1. By contrast, during the disarming of the emergency slide 13, the holding element 22 is transferred from its release position, illustrated in FIGS. 3a, 3b and 4, into its holding position, shown in FIGS. 1 and 2, by means of a

12

corresponding actuation of the selector lever which induces a clockwise rotation of the holding element 22 about the first rotary axle D1.

In its holding position, the holding element 22 is configured to connect the girt bar 12 to the passenger door 11. For this purpose, the holding element 22, which in the variant of a door arrangement 10 shown in the figures is designed in the form of a lever with lever arms extending from the first rotary axle D1, comprises a receiving portion 28 arranged in the region of a first end of the holding element 22. The receiving portion 28 is designed here in the form of a curved lever arm and engages under the girt bar 12 when the holding element 22 is situated in its holding position in the disarmed state of the emergency slide 13. In this way, the holding element 22, when arranged in its holding position in the disarmed state of the emergency slide, is in engagement with the girt bar 12 and securely fixes the girt bar 12 to the passenger door 11.

By contrast, the receiving portion 28 of the holding element 22 is positioned laterally offset in relation to the girt bar 12 with respect to a longitudinal axis L of the girt bar 12, and releases the girt bar 12 when the holding element 22, as shown in FIGS. 3a, 3b and 4, is situated in its release position in the aimed state of the emergency slide 13. The girt bar 12 is then no longer fixed to the passenger door 11 by means of the holding element 22. Accordingly, the holding element 22 and the girt bar 12 disengage when the passenger door 11 is raised in the armed state, as illustrated in FIG. 4.

A first and a second actuation portion 64, 66 are provided on the holding element 22. The first actuation portion 64 is arranged in the region of a second end of the holding element 22. By contrast, the second actuation portion 66 is arranged in the region of the first end of the holding element 22 and is formed by an end portion of the receiving portion 28 of the holding element 22.

The arresting element 24 serves for arresting the holding element 22 selectively in its holding position or in its release position. In the embodiment of a door arrangement 10 shown in the figures, the arresting element 24 is fastened to the passenger door 11 adjacently with respect to the holding element 22 and is rotatable about a second rotary axle D2 relative to the passenger door 11 between a decoupled position, shown in FIGS. 2, 3a and 3b, and an arresting position, illustrated in FIGS. 1 and 4. The second rotary axle D2 of the arresting element 24 extends substantially parallel to the first rotary axle D1 of the holding element 22. By means of an anticlockwise rotation about the second rotary axle D2, the arresting element 24 is transferred from its decoupled position into its arresting position. By contrast, a clockwise rotation of the arresting element 24 about the second rotary axle D2 has the effect that the arresting element 24 is transferred from its arresting position into its decoupled position.

When the arresting element 24 is situated in its arresting position, it interacts with the holding element 22 such that a rotation of the holding element 22 about the first rotary axle D1 is prevented. In this way, the holding element 22 can be arrested selectively in its holding position or in its release position, see FIGS. 1 and 4. By contrast, when the arresting element 24 is situated in its decoupled position, it is not in contact with the holding element 22, such that the holding element 22 can rotate freely about the first rotary axle D1, see FIGS. 2, 3a and 3b. Accordingly, the holding element 22 can then be transferred from its holding position into its release position or from its release position into its holding position.

13

The arresting element **24** is designed in the form of a lever with lever arms extending from the second rotary axle **D2**. In the region of a first end, the arresting element **24** comprises a first arresting device **30**. When the arresting element **24** is situated in its arresting position, the first arresting device **30**, which may be formed for example by an end portion of a lever arm of the arresting element **24**, is in engagement with a complementary second arresting device **32** of the holding element **22**. In this way, the holding element **22** is arrested in its holding position and/or in its release position. The second arresting device **32** of the holding element **22** comprises a first and a second arresting projection **34**, **36** which extend substantially parallel to one another from a surface, facing toward the arresting element **24**, of the holding element **22**. The first arresting projection **34** is arranged further remote from the first rotary axle **D1**, and closer to a second end of the holding element **22**, than the second arresting projection **36**.

By means of the interaction of the first arresting device **30** of the arresting element **24** with the first arresting projection **34** of the second arresting device **32** of the holding element **22**, the holding element **22** is arrested in its holding position, as shown in FIG. 1. By contrast, by means of the interaction of the first arresting device **30** of the arresting element **24** with the second arresting projection **36** of the second arresting device **32** of the holding element **22**, the holding element **22** is arrested in its release position, as shown in FIG. 4. Accordingly, the holding element **22** is rotated further anticlockwise about the first rotary axle **D1** in its release position, when the first arresting device **30** of the arresting element **24** is in engagement with the second arresting projection **36** of the holding element **22**, than in its holding position, when the first arresting device **30** of the arresting element **24** is in engagement with the first arresting projection **34** of the holding element **22**.

It is thus also the case that the arresting position that the arresting element **24** assumes in order to arrest the holding element **22** in its holding position differs from the arresting position that the arresting element **24** assumes in order to arrest the holding element **22** in its release position. In particular, in the variant of a door arrangement **10** shown in the figures, in its arresting position in which it arrests the holding element **22** in its release position, as shown in FIG. 4, the arresting element **24** is, relative to its decoupled position illustrated in FIGS. 2, 3a and 3b, rotated a few degrees further anticlockwise about the second rotary axle **D2** than in its arresting position in which it arrests the holding element **22** in its holding position, as shown in FIG. 1.

In the region of its second end, the arresting element **24** is equipped with a decoupling device **38** which, in the embodiment of a door arrangement **10** shown here, is designed in the form of a curved lever arm of the arresting element **24**. The decoupling device **38** is configured to, during the lowering of the passenger door **11**, abut against an abutment surface **40** formed on the engagement device **18**. By means of the interaction of the decoupling device **38** of the arresting element **24** with the abutment surface **40** of the engagement device **18**, the arresting element **24**, which is preloaded into its arresting position by means of a spring **42**, is rotated clockwise about the second rotary axle **D2**, and thus transferred from its arresting position into its decoupled position illustrated in FIGS. 2, 3a and 3b, counter to the force of the spring **42**.

If the passenger door **11** is situated in its raised position as shown in FIG. 1 and the emergency slide **13** is disarmed, the holding element **22** is, as described above, arranged in its

14

holding position and arrested by means of the arresting element **24** situated in its arresting position. During the lowering of the passenger door **11**, the arresting element **24** is rotated clockwise about the second rotary axle **D2**, and thus transferred from its arresting position into its decoupled position, see FIGS. 2, 3a and 3b, by means of the interaction of the decoupling device **38** of the arresting element **24** with the abutment surface **40** of the engagement device **18**. As a result, a movement of the holding element **22** from its holding position into its release position, and consequently a decoupling of the girt bar **12** from the passenger door **11**, are made possible.

If, as shown in FIG. 4, the passenger door **11** is now raised in the armed state of the emergency slide **13**, that is to say, in a state in which the girt bar **12** is fixed to the fuselage portion **2** and is locked in a decouplable manner to the engagement device **18**, the decoupling device **38** of the arresting element **24** moves away from the abutment surface **40** of the engagement device **18**, such that the arresting element **24** rotates anticlockwise about the second rotary axle **D2** owing to the preload force of the spring **42**, and thus moves back from its decoupled position into its arresting position again. Here, the first arresting device **30** of the arresting element **24** enters into engagement with the second arresting projection **36** of the second arresting device **32** of the holding element **22**, such that the holding element **22** is fixed in its release position, see FIG. 4.

The engagement device **18** fastened to the fuselage portion comprises a base plate **44**, which extends substantially parallel to a cabin floor (not illustrated in the figures) of the aircraft segment **1**. The abutment surface **40**, which is designed for interacting with the decoupling device **38**, is formed by a part of a top side of the base plate **44**. The base plate **44** is formed as a single piece with a holding portion **46**, which extends substantially parallel to the passenger door **11** and substantially perpendicular to the girt bar **12** and to the base plate **44**. In the holding portion **46**, there is formed a receiving recess which receives the girt bar **12** when the passenger door **11** is situated in its lowered position, as shown in FIGS. 2, 3a and 3b, and when the passenger door **11** is raised in the armed state of the emergency slide **13**, as illustrated in FIG. 4. The shape and the size of the receiving recess **48** are adapted to the shape and the size of the girt bar **12**. In the case of the door arrangement **10** illustrated in the figures, the receiving recess is of U-shaped form and is thus suitable for receiving the girt bar **12**, which has a substantially circular cross section.

The locking mechanism **20** of the engagement device **18** comprises a lock apparatus **50**, which is rotatable about a third rotary axle **D3** between an unlocking position, shown in FIG. 1, and a locking position, illustrated in FIGS. 2, 3a, 3b and 4. When situated in its locking position, the lock apparatus **50** permits a decoupling of the girt bar **12** from the engagement device **18**. By contrast, in its locking position, the lock apparatus serves for fixing the girt bar **12** to the engagement device **18**. A spring **52** resiliently preloads the lock apparatus **50** into its unlocking position shown in FIG. 1.

The lock apparatus **50** comprises a first lock arm **54**, which extends from the third rotary axle **D3**, and a second lock arm **56**, which likewise extends from the third rotary axle **D3**. In the exemplary embodiment of a door arrangement shown in the figures, the first and the second lock arm **54**, **56** of the lock apparatus **50** define an angle of approximately 80°. The first lock arm **54** comprises a first portion **54a**, which is arranged adjacent to the third rotary axle **D3**, and a second portion **54b**, which is arranged in the region of

15

a free end of the first lock arm **54**. The second portion **54b** is inclined relative to the first portion **54a** in the direction of the second lock arm **56**. Here, the first and the second portion **56a**, **56b** of the first lock arm **54** define an angle of approximately 135°.

As can be seen most clearly from a comparison of FIGS. **1** and **2**, the lock apparatus **50** is configured to, during the lowering of the passenger door **11** in the disarmed state of the emergency slide **13**, interact with the girt bar **12** such that the lock apparatus **50** is rotated from its unlocking position into its locking position. In particular, during the lowering of the passenger door **11** in the disarmed state of the emergency slide **13**, the girt bar **12** exerts a pressure force on the second lock arm **56** of the lock apparatus **50**, as a result of which the lock apparatus **50** is rotated clockwise about the third rotary axle **D3** from its unlocking position into its locking position. By contrast, during the raising of the passenger door **11** in the disarmed state of the emergency slide **13**, the lock apparatus **50** is rotated back anticlockwise about the third rotary axle **D3** from its locking position into its unlocking position by the force of the spring **52**.

When the lock apparatus **50** is arranged in its locking position illustrated in FIGS. **2**, **3a**, **3b** and **4**, the first lock arm **54** engages over the girt bar **12**, whereas the second lock arm **56** engages under the girt bar **12**. Accordingly, the two lock arms **54**, **56** of the lock apparatus **50** form a “gripper” which encloses the girt bar **12** and which holds the girt bar **12** in its position in the engagement device **18**, wherein, in particular, the first lock arm **54**, which engages over the girt bar **12**, serves for fixing the girt bar **12** in the receiving recess **48** of the engagement device.

Furthermore, the locking mechanism **20** comprises a blocking mechanism **58** which is configured to, during the arming of the emergency slide **13**, be actuated by the mechanism **16** of the connecting arrangement **14** in order to block the lock apparatus **50** in its locking position. Furthermore, the blocking mechanism **58** is configured to, during the disarming of the emergency slide **13**, be actuated by the mechanism **16** in order to eliminate the blocking of the lock apparatus **50** in its locking position.

The blocking mechanism **58** comprises a first lock element **60**, which is formed integrally with the lock apparatus **50**. The first lock element **60** extends, similarly to the two lock arms **54**, **56** of the lock apparatus **50**, from the third rotary axle **D3**, and forms an angle $>90^\circ$ with each of the two lock arms **54**, **56** of the lock apparatus **50**. An opening **62** is formed in the first lock element. Furthermore, the blocking mechanism **58** comprises a second lock element **65** of complementary form with respect to the first lock element. The second lock element **65** is rotatable about a fourth rotary axle **D4** between a non-engagement position, shown in FIGS. **1** and **2**, and an engagement position, illustrated in FIGS. **3a**, **3b** and **4**. When situated in its non-engagement position, the second lock element **65** releases the first lock element **60** in order to eliminate the blocking of the lock apparatus **50** in its locking position. By contrast, when arranged in its engagement position, the second lock element **65** is in engagement with the first lock element **60** in order to block the lock apparatus **50** in its locking position.

The second lock element **65** comprises a lever arm **67** which extends from the fourth rotary axle **D4** in the direction of the lock apparatus **50**. A detent opening **68** is formed in the lever arm **67**. Furthermore, the second lock element **65** is equipped with a first actuation element **70**. The first actuation element **70** is configured to, during the arming of the emergency slide **13**, interact with the mechanism **16** in order to move the second lock element **65** from its non-

16

engagement position into its engagement position. The first actuation element **70** extends, in the region of a free end of the second lock element **65**, upwards from a top side of the lever arm **67**, and comprises a carrier portion **72** which extends substantially perpendicularly upwards from the top side of the lever arm **67**. The carrier portion **72** bears a contact portion **74**, which extends substantially parallel to the lever arm **67**.

From a bottom side, facing toward the lever arm **67**, of the contact portion **74**, a pin **76** projects substantially parallel to the carrier portion **72**. The pin **76** is configured to be received in the opening **62** of the first lock element **60**. By means of the interaction of the pin **76** with the opening **62** of the first lock element **60**, the lock apparatus **50**, which is formed integrally with the first lock element **60**, is fixed in its locking position. A spring **77** serves for preloading the second lock element **65** into its non-engagement position illustrated in FIGS. **1** and **2**.

Finally, the blocking mechanism comprises a third lock element **78**, which is rotatable about a fifth rotary axle **D5** between a non-engagement position, shown in FIG. **2**, and an engagement position, illustrated in FIGS. **1**, **3a**, **3b** and **4**. When situated in its non-engagement position, the third lock element **78** releases the second lock element **65**, such that a rotation of the second lock element **65** from its engagement position, shown in FIGS. **3a**, **3b** and **4**, into its non-engagement position, illustrated in FIGS. **1** and **2**, is possible. By contrast, the third lock element **78** fixes the second lock element **65** in its engagement position when said third lock element is itself situated in its engagement position.

The third lock element **78** is equipped with a detent lug **80** which is configured to interact with the detent opening **68** provided on the second lock element **65**. In particular, the detent lug **80** projects through the detent opening **68** and lies against a detent surface **82** of the second lock element **65** when both the second lock element **65** and the third lock element **78** are situated in their engagement position, see FIGS. **3a**, **3b** and **4**. The detent surface **82** is formed by a region, adjacent to the detent opening **68**, of the top side of the lever arm **67** of the second lock element **65**. Accordingly, the detent lug **80** of the third lock element **78** prevents the second lock element **65** from being rotated anticlockwise about the fourth rotary axle **D4** from its engagement position into its non-engagement position by the force of the spring **77**.

Furthermore, the third lock element **78** comprises a second actuation element **84**. The second actuation element **84**, which extends through an opening **85** formed in the base plate **44** of the engagement device **18**, is configured to, during the disarming of the emergency slide **13**, be actuated by the mechanism **16** in order to move the third lock element **78** from its engagement position, shown in FIGS. **1**, **3a**, **3b** and **4**, into its non-engagement position, illustrated in FIG. **2**. The third lock element **78** is preloaded into its engagement position by the force of a spring **86**.

If the passenger door **11** is situated in its raised position, as shown in FIG. **1**, and the emergency slide **13** is disarmed, the lock apparatus **50** is situated in its unlocking position. The second lock element **65** is situated in its non-engagement position. By contrast, the third lock element **78** is arranged in its engagement position, but is not in engagement with the second lock element **65**.

When the passenger door **11** is lowered, the girt bar **12** comes into contact with the second lock arm **56** of the lock apparatus **50** and pushes the second lock arm **56** in the direction of the base plate **44** of the engagement device **18**. As a result, the lock apparatus **50** is transferred, clockwise

17

about the third rotary axle D3, from its unlocking position into its locking position, see FIG. 2. The receiving portion 28 of the holding element 22, which is situated in its holding position, is received in the opening 85 in the base plate 44 of the engagement device 18 during the lowering of the passenger door 11. Furthermore, the second actuation portion 66 formed on the holding element 22 interacts with the second actuation element 84 of the third lock element 78. By means of the pressure force exerted on the second actuation element 84 by the second actuation portion 66 of the holding element 22, the third lock element 78 is, as shown in FIG. 2, rotated clockwise about the fifth rotary axle D5 from its engagement position into its non-engagement position counter to the force of the spring 86. Finally, the arresting element 24 is, as a result of the lowering of the passenger door 11, transferred from its arresting position into its decoupled position, whereby, as described above, a movement of the holding element 22 from its holding position into its release position is made possible.

If the arming of the emergency slide 13 is now activated by means of the activation device 26, the holding element 22 is rotated anticlockwise about the first rotary axle D1 into its release position, see FIGS. 3a and 3b. Here, the first actuation portion 64 formed on the holding element 22 abuts against the first actuation element 70 of the second lock element 65. In particular, the first actuation portion 64 exerts a pressure force on the contact portion 74 of the first actuation element 70, as a result of which the second lock element 65 is rotated clockwise about the fourth rotary axle D4 from its non-engagement position into its engagement position shown in FIGS. 3a, 3b and 4.

As a result, the pin 76 formed on the second lock element 65 is introduced into the opening 62 of the first lock element 60, which is formed integrally with the lock apparatus 50. Furthermore, during the movement of the second lock element 65 from its non-engagement position into its engagement position, the detent lug 80 of the third lock element 78 is guided through the detent opening 68 formed in the lever arm 67 of the second lock element 65. Here, the rotation of the holding element 22 from its holding position into its release position causes the decoupling of the second actuation portion 66 of the holding element 22 from the second actuation element 84 of the third lock element 78. The third lock element 78 is accordingly rotated back anticlockwise about the fifth rotary axle D5 from its non-engagement position into its engagement position by the force of the spring 86.

At the end of the arming process, both the second lock element 65 and the third lock element 78 is situated in its engagement position, in which the detent lug 80 of the third lock element 78 lies against the detent surface 82 of the second lock element 65 and holds the second lock element 65 in its engagement position counter to the force of the spring 77. The second lock element 65 in turn, by means of its interaction with the first lock element 60, fixes the lock apparatus 50, which is formed integrally with the first lock element 60, in its locking position. Accordingly, the blocking mechanism 58 blocks the lock apparatus 50 in its locking position, in which it fixes the girt bar 12 to the engagement device 18.

If, finally, the passenger door 11 is raised in the armed state of the emergency slide 13, as shown in FIG. 4, the girt bar 12 remains fixed to the engagement device 18, and consequently to the fuselage portion 2, by means of the lock apparatus 50 of the locking mechanism 20. The emergency slide 13 can deploy, and is securely held on the fuselage portion 2 by means of the interaction of the girt bar 12 with

18

the locking mechanism 20. By contrast, those components 22, 24 of the mechanism 16 which are fastened to the passenger door 11 decouple from the girt bar 12 and from the engagement device 18 during the raising of the passenger door 11. As soon as the decoupling device 38 of the arresting element 24 is raised from the abutment surface 40 formed on the base plate 44, the arresting element 24 rotates anticlockwise about the second rotary axle D2 owing to the preload force of the spring 42, until the first arresting device 30 of the arresting element 24 engages with detent action, as described above, with the second arresting projection 36 of the second arresting device 32 of the holding element 22, and thus arrests the holding element 22 in its release position.

By contrast, if it is the intention for the armed state of the emergency slide 13 illustrated in FIGS. 3a and 3b to be eliminated and for the emergency slide 13 to be disarmed, the activation device 26 is activated again. In the event of an activation of the activation device 26 for the purposes of disarming the emergency slide 13, the manual actuation of the selector lever however induces a rotation of the holding element 22 clockwise about the first rotary axle D1 from its release position shown in FIGS. 3a and 3b into its holding position. Here, the second actuation portion 66 of the holding element 22 of the third lock element 78 interacts, whereby the third lock element 78 is moved clockwise about the fifth rotary axle D5 into its non-engagement position shown in FIG. 2. As a result, the detent lug 80 of the third lock element 78 decouples from the detent surface 82 formed on the second lock element 65, and the second lock element 65 is also rotated anticlockwise about the fourth rotary axle D4 from its engagement position into its non-engagement position by the force of the spring 77.

As a result, the pin 76 of the second lock element 65 decouples from the opening 62 of the first lock element 60, and the lock apparatus 50, which is formed integrally with the first lock element 60, is rotated anticlockwise about the third rotary axle D3 from its locking position into its unlocking position by the force of the spring 52. The blocking mechanism 58 is consequently configured to, during the disarming of the emergency slide 13, be actuated by the mechanism 16, that is to say, by the second actuation portion 66 formed on the holding element 22, in order to eliminate the blocking of the lock apparatus 50 in its locking position.

If the passenger door 11 is now raised, the girt bar 12 is driven along by the receiving portion 28 of the holding element 22 and is thus securely fixed to the passenger door 11 again. Furthermore, the arresting element 24 rotates anticlockwise about the second rotary axle D2 owing to the preload force of the spring 42, until the first arresting device 30 of the arresting element 24 engages with detent action, as described above, with the first arresting projection 34 of the second arresting device 32 of the holding element 22, and thus arrests the holding element 22 in its release position, as soon as the decoupling device 38 of the arresting element 24 is raised from the abutment surface 40 formed on the base plate 44.

The door arrangement 10 described here is advantageous, in particular, with regard to at least some of the following points:

The girt bar is fixed to the engagement device already immediately during the arming of the emergency slide.

An additional locking step that first takes place during the activation of the emergency slide is thus avoided.

The connecting arrangement has a small number of individual components and therefore a low weight.

During the arming of the emergency slide, the girt bar remains in its position in relation to emergency slide, door and fuselage portion.

Relatively low complexity of the connecting arrangement, with a positive effect on production and assembly times.

Robust interface between door, girt bar and fuselage portion with regard to handling and tolerance effects. Shorter/fewer production and maintenance times/interruptions.

While at least one exemplary embodiment of the present invention(s) is disclosed herein, it should be understood that modifications, substitutions and alternatives may be apparent to one of ordinary skill in the art and can be made without departing from the scope of this disclosure. This disclosure is intended to cover any adaptations or variations of the exemplary embodiment(s). In addition, in this disclosure, the terms "comprise" or "comprising" do not exclude other elements or steps, the terms "a" or "one" do not exclude a plural number, and the term "or" means either or both. Furthermore, characteristics or steps which have been described may also be used in combination with other characteristics or steps and in any order unless the disclosure or context suggests otherwise. This disclosure hereby incorporates by reference the complete disclosure of any patent or application from which it claims benefit or priority.

The invention claimed is:

1. A door arrangement for an aircraft segment, which door arrangement comprises:
 - a passenger door,
 - a fuselage portion accommodating the passenger door, wherein the passenger door is movable relative to the fuselage portion between a raised position and a lowered position, and
 - a girt bar for arming and disarming an emergency slide, which girt bar is connectable by means of a connecting arrangement to at least one of the passenger door or to the fuselage portion,
 wherein the connecting arrangement comprises a mechanism which is configured to, during arming of the emergency slide, actuate a locking mechanism of an engagement device fastened to the fuselage portion, such that the girt bar is fixed in a decouplable manner to the engagement device,
 - wherein the locking mechanism of the engagement device comprises:
 - a lock apparatus which is rotatable about a third rotary axle between an unlocking position and a locking position, wherein the lock apparatus is configured, in the unlocking position, to permit a decoupling of the girt bar from the engagement device, and is configured, in the locking position, to fix the girt bar to the engagement device, and
 - a blocking mechanism attached to the fuselage portion and stationary relative thereto when the passenger door is moved between the raised position and the lowered position, the blocking mechanism configured to at least one of:
 - during the arming of the emergency slide, be actuated by the mechanism to block the lock apparatus in the locking position, or
 - during the disarming of the emergency slide, be actuated by the mechanism to eliminate the blocking of the lock apparatus in the locking position.
2. The door arrangement according to claim 1, wherein at least one of:

the mechanism of the connecting arrangement is configured to connect the girt bar to the passenger door in a disarmed state of the emergency slide, or

the engagement device of the connecting arrangement is configured to connect the girt bar to the fuselage portion in an armed state of the emergency slide.

3. The door arrangement according to claim 1, wherein the mechanism of the connecting arrangement is furthermore configured to, during disarming of the emergency slide, actuate the locking mechanism of the engagement device fastened to the fuselage portion, such that the locking mechanism is unlocked.

4. The door arrangement according to claim 1, wherein the connecting arrangement is configured to, during the arming of the emergency slide, hold the girt bar positionally fixed relative to the passenger door situated in the lowered position.

5. The door arrangement according to claim 1, wherein the mechanism comprises a holding element which is fastened to the passenger door and which is rotatable about a first rotary axle relative to the passenger door between a holding position and a release position,

wherein the holding element is configured, in the holding position, to connect the girt bar to the passenger door and is configured, in the release position, to release the girt bar, and

wherein the holding element comprises at least one of:

a receiving portion which is arranged in a region of a first end of the holding element and which is configured to receive the girt bar, and hold the girt bar in a position relative to the passenger door, when the holding element is situated in the holding position in a disarmed state of the emergency slide, or

a first actuation portion which is arranged in a region of a second end of the holding element and which is configured to actuate the locking mechanism of the engagement device such that the girt bar is fixed in a decouplable manner to the engagement device when the holding element is rotated about the first rotary axle relative to the passenger door from the holding position into the release position during the arming of the emergency slide.

6. The door arrangement according to claim 5, wherein the receiving portion of the holding element comprises a second actuation portion which is configured to actuate the locking mechanism of the engagement device such that the locking mechanism is unlocked when the holding element is rotated about the first rotary axle relative to the passenger door from the release position into the holding position during the disarming of the emergency slide.

7. The door arrangement according to claim 5, wherein the mechanism comprises an arresting element which is fastened to the passenger door and which is rotatable about a second rotary axle relative to the passenger door between at least one arresting position and a decoupled position,

wherein the arresting element is configured, in the arresting position, to arrest the holding element in at least one of the holding position or the release position and is configured, in the decoupled position, to permit a rotation of the holding element about the first rotary axle, and

wherein the arresting element comprises:

a first arresting device which is arranged in a region of a first end of the arresting element and which is configured to engage with a complementary second

21

arresting device of the holding element in order to arrest the holding element in at least one of the holding position or the release position when the arresting element is situated in the arresting position,
or

a decoupling device which is arranged in a region of a second end of the arresting element and which is configured to, during the lowering of the passenger door, abut against an abutment surface, which is formed on the engagement device, to rotate the arresting element about the second rotary axle from the arresting position into the decoupled position.

8. The door arrangement according to claim 5, which furthermore comprises:

an activation device which is configured to activate the arming and disarming of the emergency slide, wherein the activation device is configured to trigger a movement of the holding element between the holding position and the release position.

9. The door arrangement according to claim 1, wherein the engagement device comprises a holding portion in which a receiving recess is formed, wherein the receiving recess is configured to receive the girt bar.

10. The door arrangement according to claim 1, wherein the lock apparatus is configured to, during the lowering of the passenger door in a disarmed state of the emergency slide, interact with the girt bar such that the lock apparatus is rotated from the unlocking position into the locking position.

11. The door arrangement according to claim 1, wherein the lock apparatus comprises at least one of:

a first lock arm which extends from the third rotary axle and which is configured to engage over the girt bar in a lowered state of the passenger door, or

a second lock arm which extends from the third rotary axle and which is configured to engage under the girt bar in the lowered state of the passenger door.

12. An aircraft segment which comprises a door arrangement according to claim 1.

13. A door arrangement for an aircraft segment, which door arrangement comprises:

a passenger door,

a fuselage portion accommodating the passenger door, wherein the passenger door is movable relative to the fuselage portion between a raised position and a lowered position, and

a girt bar for arming and disarming an emergency slide, which girt bar is connectable by means of a connecting arrangement to at least one of the passenger door or to the fuselage portion,

wherein the connecting arrangement comprises a mechanism which is configured to, during arming of the emergency slide, actuate a locking mechanism of an engagement device fastened to the fuselage portion, such that the girt bar is fixed in a decouplable manner to the engagement device,

22

wherein the locking mechanism of the engagement device comprises:

a lock apparatus which is rotatable about a third rotary axle between an unlocking position and a locking position, wherein the lock apparatus is configured, in the unlocking position, to permit a decoupling of the girt bar from the engagement device, and is configured, in the locking position, to fix the girt bar to the engagement device, and

a blocking mechanism which is configured to at least one of:

during the arming of the emergency slide, be actuated by the mechanism to block the lock apparatus in the locking position, or

during the disarming of the emergency slide, be actuated by the mechanism to eliminate the blocking of the lock apparatus in the locking position, wherein the blocking mechanism comprises:

a first lock element which is formed on the lock apparatus and which extends from the third rotary axle of the lock apparatus,

a second lock element which is of complementary design with respect to the first lock element and which is rotatable about a fourth rotary axle between a non-engagement position and an engagement position,

wherein the second lock element, in the non-engagement position, releases the first lock element to eliminate the blocking of the lock apparatus in the locking position, and, in the engagement position, is in engagement with the first lock element to block the lock apparatus in the locking position, and

a third lock element which is rotatable about a fifth rotary axle between a non-engagement position and an engagement position, wherein the third lock element, in the non-engagement position, releases the second lock element to permit a rotation of the second lock element from the engagement position into the non-engagement position, and, in the engagement position, is in engagement with the second lock element to fix the second lock element in the engagement position.

14. The door arrangement according to claim 13, wherein at least one of:

the second lock element comprises a first actuation element which is configured to, during the arming of the emergency slide, be actuated by the mechanism in order to move the second lock element from the non-engagement position into the engagement position, or

the third lock element comprises a second actuation element which is configured to, during the disarming of the emergency slide, be actuated by the mechanism in order to move the third lock element from the engagement position into the non-engagement position.

* * * * *